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Extended Storage and Transportation (EST)

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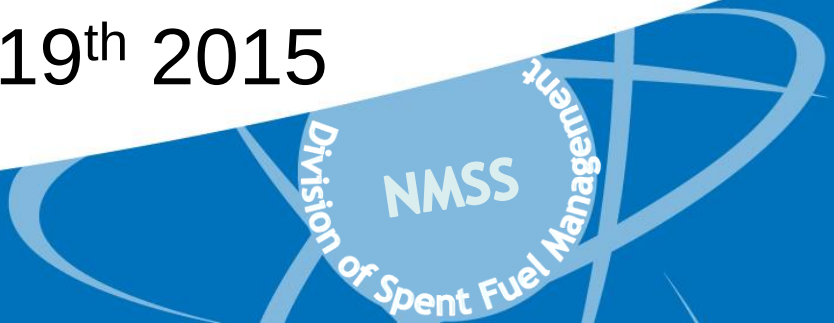

EST - Background

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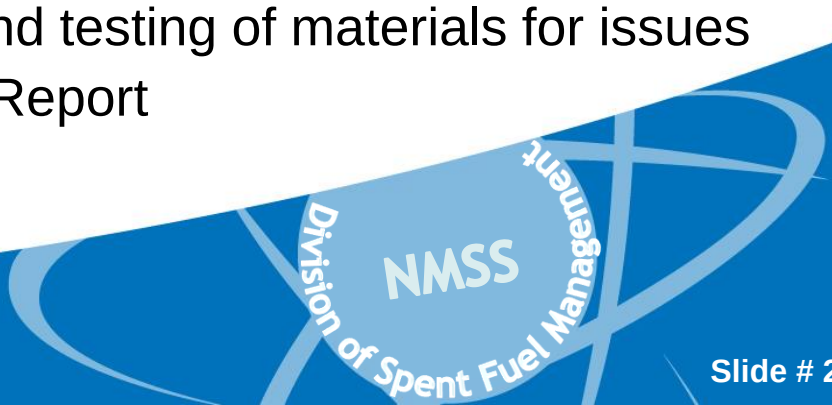
- EST Regulatory Program Review examines the technical needs and potential changes to the regulatory framework to ensure safe and secure storage of spent fuel for extended periods (beyond 120 years) and subsequent transportation
- Reviewed gap assessments for EST technical and regulatory issues
- “Identification and Prioritization of the Technical Information Needs Affecting Potential Regulation of Extended Storage and Transportation of Spent Nuclear Fuel” (TIN Report) issued in May 2014
- Performing short-term research and testing of materials for issues and phenomena identified in TIN Report



Areas of Focus in EST TIN Report

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- Atmospheric Stress Corrosion Cracking: completed NUREG/CR-7170
- Fuel Pellet Swelling – Evaluate stress on fuel cladding:
  completed Cladding Stress Analysis Report
- Thermal calculations - Improved thermal model for horizontal canisterized systems and non-ventilated vertical casks:
  completed horizontal cask system modeling (NUREG/CR-7191)
  completed vertical bolted cask final pre-validation task
- Residual Moisture – effects of incomplete vacuum drying:
  completed 3 NRC reports and will monitor DOE demo project
- In-service functional monitoring methods:
  completed Functional Monitoring Report
- Potential concrete degradation processes

Aging Management for Extended Storage and Transportation of Dry Cask Storage Systems

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- Objective
  - Provide the technical basis for regulatory guidance from NMSS on license renewal of DCSSs with respect to degradation mechanisms
- Status
  - Development of Aging Management Tables (AMTs) for 5 systems:
    - NUHOMS, HI-STORM, HI-STAR, TN-32/68 are complete
    - MAGNASTOR under NRC review
- Path Forward
  - Final TLRs: 60-year timeframe expected in June 2016
    300-year timeframe expected in October 2016
  - Additional systems?

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Concrete Degradation

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- Objective
  - Enhance the existing technical bases of DCSS to evaluate concrete degradation, inspection and monitoring techniques to support Aging Management Tables and Programs
  - Identify further information to keep maintaining the intended safety functions of concrete components for long term storage
- Status
  - Public Expert Panel Workshop held in February 2015
  - Workshop report sent to NMSS for comment in October 2015
- Path Forward
  - NMSS reviewing
  - Finalize report by December 2015

EST Future Work

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- Path Forward
  - Additional systems for AMTs
  - Chloride-induced stress corrosion cracking (CISCC)
    - Continuing engagement with Licensees, Certificate Holders, EPRI, and NEI
    - ASME Code Case for In-service Inspection of Dry Cask Storage Systems
  - Thermal modeling of ventilated vertical canister
  - Microbiologically-induced corrosion (MIC)

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EST – Relationship to Storage Renewal Framework

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- NUREG-1927, Rev. 1 and Managing Aging Processes for Storage (MAPS) are focused on, but not limited to, the first renewal period
  - include concept of “learning AMPs” that respond to operational experience over time
- EST work and operational experience from first renewal period will inform subsequent license/CoC renewals and need for further guidance development for subsequent renewal periods

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EST – Shift in Focus

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- EST traditional research work is slowing down
- Research on EST conducted to date has not indicated any need to change existing regulations
- Shift in focus to support continued development of learning aging management programs and use of operational experience to update guidance

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References

- Identification and Prioritization of the Technical Information Needs Affecting Potential Regulation of Extended Storage and Transportation of Spent Nuclear Fuel - ML14043A402
- Assessment of Stress Corrosion Cracking Susceptibility for Austenitic Stainless Steels Exposed to Atmospheric Chloride and Non-Chloride Salts - ML14051A417
- Cladding Stress during Extended Storage of High Burnup Spent Nuclear Fuel ML14350B340
- Thermal Analysis of Horizontal Storage Casks for Extended Storage Applications - ML14352A098
- Extended Storage and Transportation: Evaluation of Drying Adequacy - ML13169A039
- Overview of Vacuum Drying Methods and Factors Affecting the Quantity of Residual Water after Drying - ML13192A125
- Vacuum Drying Test Plan - ML13192A127
- Available Methods for Functional Monitoring of Dry Cask Storage Systems - ML14323A067

Acronyms

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- AMP – Aging Management Program
- AMT – Aging Management Table
- CISCC - Chloride-induced stress corrosion cracking
- CNWRA – Center for Nuclear Waste Repository Analyses
- COC – Certificate of Compliance
- DCSS – Dry Cask Storage System
- EPRI – Electric Power Research Institute
- EST – Extended Storage and Transportation
- MAPS – Managing Aging Processes for Storage
- NEI – Nuclear Energy Institute
- NMSS – Nuclear Material Safety and Safeguards
- NWTRB – Nuclear Waste Transportation Review Board
- SRS – Savannah River Site
- TIN – Technical Information Needs
- TLR – Technical Letter Report